

## Chapter 55

# Nutraceutical and Functional Foods in Cancer Management and Therapy

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### ABSTRACT

*Cancer is an insidious disease affecting mankind in every country. The progression of cancer cells from one part of the body to another (metastasis) is one of the biggest problems in curing cancer. The present study brings new hope of future therapies to fight cancer. Designing an appropriate food to maintain proper health has become a necessity worldwide. Due to this, the food industries in many countries are modifying their products as a response to consumer demands. In recent years, many of the natural products are gaining popularity as nutraceuticals.*

### INTRODUCTION

Active substances whichever way extracted from plants (phytochemicals) or of animal origin extracted, concentrated and administered in an appropriate pharmaceutical form, can make an exceptionally encouraging toolbox helpful to forestall and bolster the therapy of some pathologic conditions given their demonstrated clinical adequacy. It is overall perceived that diet and lifestyle are fundamental to advance and keep up prosperity and decent being state, other than help to forestall ailments conceivable beginning. Both non-correct dietary habits and lifestyle can, indeed, determine pathological conditions.

Prevention is the key methodology for an effective proactive medicine, in which endeavors are routed to prevention and, consequently, to bring down the risk associated with lifestyle-related diseases diminishing, in the meantime, any National Health Systems cost expected to ensure the correct restorative approach given pharmaceuticals. Nutraceuticals use in counteractive action is a proactive switch ap-

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proach tool to pre-clinical health conditions. They can be adequately utilized, by including in the daily diet, in a region which shades in the range “past the diet, before drugs,” since they join both dietary and helpful healthy properties of food extracts with the mending properties of specific active compounds.

Nutraceuticals characterize another classification which shades the outskirts between drugs and food. Nutraceutical, a portmanteau of the words “nutrient” and “pharmaceutical”, was coined by Stephen De-Felice, who defined nutraceuticals as “foods (or part of a food) that provide medical or health benefits in addition to its nutritional content, including the prevention and/or treatment of a disease” (DeFelice, 1995). Nutraceuticals are ‘natural’ substances isolated or purified from food substances and used in a medicinal fashion. Several naturally derived food substances have been studied in cancer in an attempt to identify natural preventative therapies for this disease. Vitamin E, selenium, vitamin D, green tea, soy, and lycopene have all been examined in human studies. Other potential nutraceuticals that lack human data, most notably pomegranate, might also have a preventative role in this disease. Recently, nutraceuticals have gained much attention in the area of cancer research because of their pleiotropic effects and relatively non-toxic behavior (Nair, Sung, Yadav, Kannappan, Chaturvedi, & Aggarwal, 2010).

Otherwise, the boundary between nutraceuticals and functional foods is not always clear being the main difference the format in which they are consumed: nutraceuticals are consumed as capsules, pills, tablets, etc. while functional foods are always consumed as ordinary foods. Thus, when a phytochemical is included in a food formulation is considered a functional food. If the same phytochemical is included in a capsule it will constitute a nutraceutical. The capacity of some plant-derived foods to reduce the risk of chronic diseases has been associated, at least in part, to the occurrence of secondary metabolites (phytochemicals) that have been shown to exert a wide range of biological activities. In general, these metabolites have low potency as bioactive compounds when compared to pharmaceutical drugs, but since they are ingested regularly and in significant amounts as part of the diet, they may have a noticeable long-term physiological effect (Espín, García-Conesa, & Tomás-Barberán, 2007).

Cancer is regarded as one of the most fatal diseases and characterized by the uncontrolled growth of abnormal cells (Pérez-Herrero & Fernández-Medarde, 2015) is a multistage process by which a normal cell is transformed into a cancerous cell. It interplays between genes and the environment, and multiple cumulative genetic changes are required for the transformation of normal cells into fully malignant cells. Essentially, self-sufficiency in growth signals, insensitivity to growth inhibitory (antigrowth) signals, evasion of programmed cell death (apoptosis), limitless replicative potential, sustained angiogenesis, and tissue invasion and metastasis are the main characteristics of tumourigenesis (Deorukhkar, Krishnan, Sethi, & Aggarwal, 2007).

Chemopreventive molecules target each of these steps including anti-initiation strategies (e.g DNA repair, detoxification, free-radical scavenging and carcinogen metabolism) and antipromotional strategies (e.g. Free-radical scavenging, proliferation, suppression, differentiation induction, immunity enhancement, inflammation reduction, increase in apoptosis, altered gene expression and decreases in angiogenesis (Balunas & Kinghorn, 2005; Tsao, Kim, & Hong 2004). From initial development of a single cell, to invasion, angiogenesis, proliferation and metastasis, there are many cellular mediators involved to be manipulated. Although predisposing of cancer cannot be signaled out by a single factor, a panel of factors places some people at a higher risk. Most of the high-risk cases may have a genetic background, but dietary choices could dictate the outcome of health (Pericleous, Mandair, & Caplin, 2013). Bioactive components of dietary phytochemicals with chemopreventive properties include curcumin, genistein, resveratrol, diallyl sulphide, S-allyl cysteine, allicin, lycopene, capsaicin, diosgenin, (6)-gingerol, ellagic acid, ursolic acid, catechins, eugenol, isoeugenol, carotene, lycopene, isoflavones and flavonoid (Ag-

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